3D DLP printing of epoxy based materials controlled by the addition of derivate of pyridines

Emile Goldbach, Lucile Halbardier, Céline Croutxé-Barghorn, Xavier Allonas, Christian Ley

Laboratory of Macromolecular Photochemistry and Engineering, University of Haute Alsace, 68093 Mulhouse France

**e-Mail : emile.goldbach@uha.fr*

Additive manufacturing, especially 3D DLP printing, has undergone several technological improvements over the years. However, the photosensitive resins are mostly based on the radical polymerization of acrylate monomers due to a fast reaction and a spatial and temporal control under exposure. Nevertheless, other type of polymerization can be implemented to extend the applications field. The cationic chain polymerisation of epoxy monomers is an interesting alternative. However, the confinement of the reaction is limited due the living characteristic of the active specie. Furthermore, there is a lack of control over the reaction, as the polymerization rate, inhibition and exothermicity depends strongly of the monomer used[1-5].

In order to have a control over theses parameters regardless the structure of the monomer, several retarding agents and inhibitors have been investigated, such as ether crowns[6] and amines[7-10]. Especially, derivate of pyridines enable a various control over the reaction, which help to confine the polymerization and permits printability[11].

In this communication, several derivate of pyridines were investigated in order to adjust the epoxy polymerization kinetic. The reversible addition of the initiating specie H^+ on these compounds ensure the printability of complexes materials due to the significant increase of the reaction confinement. Moreover, several parameters (impact of the inhibition, heat flow, dark polymerization) are discussed to explain the high resolution of the printed material obtained.

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